

## **REMARKS**

Reconsideration of the present application is respectfully requested.

### **Summary of Rejections**

Claims 25, 26, 28-31, 35, 43, 44, and 46-48 were rejected under 35 U.S.C. § 103(a) based on U.S. Patent no. 6,434,681 of Armangau et al. ("Armangau") in view of U.S. Patent no. 6,175,900 of Forin et al. ("Forin"). Claims 32-34 were rejected under 35 U.S.C. § 103(a) based on Armangau in view of U.S. Patent no. 6,665,815 of Goldstein et al. ("Goldstein").

### **Status of Amendments**

Claims 1-24 and 37-39 were previously canceled. In this amendment, claims 25, 35, 41, 43 and 46-49 have been amended, and claims 50-55 have been added. No claims have been canceled in this amendment. No new matter has been added.

Therefore, claims 25-35 and 40-55 are now pending.

### **Request for Telephone Interview**

If the Examiner does not find the present application to be allowable after considering this response, Applicants respectfully request that the Examiner contact the undersigned at (408) 720-8300 to schedule a telephone interview, before taking further action on this application.

### **Response to Rejections**

Applicants respectfully traverse the rejections. As with the previous

amendments, the above amendments are submitted only to place the claims in what Applicants consider to be better form. The amendments are *not* made in response to the rejections or to comply with any statutory requirement of patentability, since no such amendments are believed to be necessary (as will be apparent from the discussion below).

Independent claims 25, 35 and 43 stand rejected under 35 U.S.C. § 103(a) based on Armangau in view of Forin. Claim 43 is representative of these claims and new claim 51 for purposes of discussing the present rejections. Note that independent claim 32 is argued separately below.

Claim 43 recites (as amended):

43. (Currently amended) A method comprising:  
maintaining a plurality of persistent point-in-time images of a file system, each persistent point-in-time image representing a state of said file system at a particular point in time, each persistent point-in-time image having associated therewith a separate map indicating in-use blocks and free blocks of the file system at the corresponding point in time; and  
generating a summary map as a logical OR of said maps associated with at least two of said persistent point-in-time images.  
(Emphasis added.)

To support a rejection for obviousness, the cited combination of references must teach or suggest *all of the claim limitations*. *In re Vaeck*, 947 F.2d 488, 20 USPQ.2d 1438 (Fed. Cir. 1991); MPEP § 706.02(j) (emphasis added). Applicants respectfully submit that no *combination* of Armangau and/or Forin discloses *all of the limitations* of claim 43 or renders the claimed method obvious.

As discussed further below, Applicants respectfully maintain the following

reasons why the current rejections are in error (any one of which alone is sufficient to overcome the rejections):

1. No disclosure or suggestion of generating a summary map as a logical OR of maps indicating free and in-use blocks:
  - a) No logical *OR* disclosed or suggested in the cited art.
  - b) Even assuming *arguendo* a logical OR is disclosed, the cited combination still fails to disclose or suggest generating a summary map as a logical OR of said maps.
2. No disclosure or suggestion in Armangau of a map of information indicating in-use blocks and free blocks associated with a file system.
3. No disclosure or suggestion of generating a summary map as a logical OR of maps indicating free and in-use blocks of persistent point-in-time images or snapshots of a file system.

In the present Office Action, the Examiner responds to these arguments. However, Applicants respectfully submit that each and every one of the Examiner's responses is erroneous, as will now be explained.

#### Detailed Arguments

First, Applicants would like to respond to the Examiner's comments on pages 8-9 of the present Final Office Action, under subheading "A". The Examiner states:

- A. No logical operation.  
Applicant argues that the difference between the Applicants [*sic*] invention in the Forin reference is:  
Applicant's invention has combined/generated three of the four possible input states as: free or free; free or in-used; and in-used or free.  
The Forin reference has combined only one of four possible input

states as: free and free.

The Examiner has apparently misread Applicants' arguments, since Applicants have *not* made the above argument, as summarized above by the Examiner. The above quote appears to be a gross distortion of Applicants' arguments.

Applicants' arguments are as follows:

**1. Neither Armangau nor Forin discloses or suggests generating a summary map as a logical OR of maps indicating free and in-use blocks.**

**a) No logical *OR* operation disclosed.**

The Examiner has admitted that Armangau fails to disclose "as a logical union" (Final Office Action, p. 3). However, the Examiner contends that Forin teaches this feature, and that it would be obvious to combine the teachings of Forin and Armangau to achieve the present invention.

In the Advisory Action mailed on 11/1/2006, the Examiner clarified why she believes that Forin discloses "as a logical union" (rephrased as "logical *OR*" in the present amendment). In the RCE filed on 11/17/2006, Applicants explained in detail why the Examiner's interpretation of Forin is incorrect (that explanation is reiterated below), i.e., because the Examiner *ignored* half of the possible input states in characterizing the logic operation in Forin.

In the present Final Office Action, the Examiner responds to Applicants' argument as follows (Final Office Action, pp. 14-15, subheading "B"):

It is noted that since the claimed limitation recites "maintaining an active map of information indicating in-used blocks and free blocks", as

detailed in the Advisory action, there are 4 possible outcomes, or all 4 possible inputs; it is hence only the inputs regarding the claimed limitations in-used and free blocks read on Forin reference. It would not be proper for the examiner to give words of the claims special meaning when no such special meaning has been defined by the Applicant in the claim language as the Examiner's interpretation of the claim scope is consistent with term used [*sic*].

Applicants' response to this is twofold:

First, the Examiner did not cite Forin for the limitation, "maintaining an active map of information indicating in-used blocks and free blocks." Rather, the Examiner cited Forin for the limitation "as a logical union". Therefore, the Examiner's response is completely misplaced.

Second, Applicants' argument neither requires nor suggests giving any words in the claims special meaning. Applicants' argument simply points out how the Examiner has mischaracterized Forin.

Thus, Applicants maintain their argument as follows:

The Examiner has cited Forin as disclosing "as a logical union" (or logical OR). However, assuming *arguendo* Forin discloses using any logic operation to form a summary map, it could only be a logical *AND* operation, *not* a logical *OR* operation as recited in claims 25, 35, 43 and 51.

The Examiner disagrees and explains her reasoning on pages 2-5 of the Advisory Action mailed on 11/1/2006. The Examiner correctly notes that Forin discloses four possible states for a memory block, which the Examiner calls "State 1", "State 2", "State 3", and "State 4", corresponding to bit combinations "01", "11", "10" and "00", respectively. However, the Examiner states, "Of all four states above, only two

states: State 1 (free blocks) and State 2 (in-use blocks), are mentioned in the final office action" (Advisory Action, page 3).

Thus, the Examiner **ignores** half of the possible input states in attempting to support her conclusion, which has led to a significant error in the Examiner's reasoning.

The Examiner has focused only on "State 1" and "State 2", ignoring what would happen if the inputs to the logic operation include "State 3" and/or "State 4". **One cannot understand or correctly characterize a logic operation by looking at only some of the input states that can affect the output.**

In the Advisory Action (pp. 4-5), the Examiner states:

First, the condition clause "**if both blocks are free**", then block C is **free**; implies for possible outcomes as:

Outcome 1: if block A is **free**, block B is **free**, then block C is **free**.

Outcome 2: if block A is **free**, block B is **in-used**, then block C is **in-used**.

Outcome 3: if block A is **in-used**, block B is **free**, then block C is **in-used**.

Outcome 4: if block A is **in-used**, block B is **in-used**, then block C is **in-used**.

Second, the following outcomes show the results when applying the two bit values of Forin (01 corresponds to **free**, and 11 corresponds to **in-used**, See State 1, 2 above) to the corresponding allocation states:

Outcome 1: if block A is **01**, block B is **01**, then block C is **01**.

Outcome 2: if block A is **01**, block B is **11**, then block C is **11**.

Outcome 3: if block A is **11**, block B is **01**, then block C is **11**.

Outcome 4: if block A is **11**, block B is **11**, then block C is **11**.

Third, applying a logical AND operation to the above outcomes, the outcomes could be written as:

Outcome 1: 01 AND 01 = 01 (correct)

Outcome 2: 01 AND 11 = 11 (**incorrect**)

Outcome 3: 11 AND 01 = 11 (**incorrect**)

Outcome 4: 11 AND 11 = 11 (correct)

for the above reasons, it is incorrect when applying an intersection (AND) operation to the outcome two, and outcome three, force, and applying a logical OR operation to the above outcomes, the outcomes can be written as:

Outcome 1: 01 OR 01 = 01 (correct)

Outcome 2: 01 OR 11 = 11 (correct)

Outcome 3: 11 OR 01 = 11 (correct)  
Outcome 4: 11 OR 11 = 11 (correct)  
Examiner thus maintains the rejection, and asserts that foreign  
does teach a logical union (OR).

In response, Applicants submit that, in order to correctly determine what type of logic operation Forin discloses in connection with coalescing adjacent blocks, one must consider **all of the possible input states**. The Examiner has focused only on "State 1" (01) and "State 2" (11), **ignoring what would happen if the inputs to the logic operation include "State 3" (10) or "State 4" (00)**. By ignoring two of the four possible bit combinations disclosed in Forin as possible inputs (i.e., 10 and 00), the Examiner has mischaracterized the logic operation. For example, performing a (bitwise) logical OR on the pair of inputs [00, 01] (a case which the Examiner ignored) produces a result of 01; that result would be **incorrect** in the system of Forin, however, since "00" in Forin represents a sub-allocated block (col. 7, lines 37-43), which should not be coalesced with a free block.

Furthermore, the Examiner's logic on pages 4-5 of the Advisory Action improperly relies upon applying **bitwise** (bit-by-bit) logic to the arbitrary bit combinations that Forin uses to represent the possible input states (and again, improperly ignoring two of the four possible input states). By performing **bitwise** logic, the Examiner loses sight of the **overall concept** that Forin discloses for coalescing, and thereby mischaracterizes the logic function. To determine what logic operation Forin discloses, one must understand and correctly represent the **overall concept**, taking into consideration **all possible input states**. Applicants will now do that, as follows:

As Applicants have noted, the **only** situation disclosed in Forin in which two adjacent blocks A and B should be coalesced into a single piece of memory is when **both** blocks are **free**. Thus, there are only two input conditions that matter for purposes of determining whether two blocks A and B can be coalesced into a single piece of memory: a block is **free** or it is **not free**. Although Forin does not define a state called “not free”, **for purposes of analyzing the logic operation** we can properly represent all three bit combinations “00”, “10” and “11” in Forin as a single logic state, **not free**, since those three states are treated the same way in Forin when determining whether to coalesce two adjacent blocks. Therefore, for purposes of discussion, we can logically represent the bit combination “01” in Forin as a **logic 1** input (meaning “**free**”) and collectively represent **all** of bit combinations “00”, “10” and “11” in Forin as a **logic 0** input (meaning “**not free**”). Hence, for purposes of determining whether to coalesce two blocks A and B, blocks A and B each can have possible input values of logic 1 (free) or logic 0 (not free). Again, while Applicants have combined/generalized three of the four possible input states into one input state (not free), those three states are nonetheless fully represented in the logic function described below and are not ignored (as the Examiner did), since those three states are all properly treated the same way for purposes of coalescing.

On the output side of the logic function, there are two possible outcomes: a decision to **coalesce** or **do not coalesce**. Accordingly, we can represent a decision to coalesce as a logic 1 in the output and a decision not to coalesce as a logic 0 in the output. Thus, the determination of whether two blocks A and B should be coalesced in Forin is **correctly** represented by the following truth table, where a logic 1 in the input



means **free** (bit combination 01 in Forin), a logic 0 in the input means **not free** (any of bit combinations 10, 00, or 11 in Forin), a logic 1 in the output means that blocks A and B **should** be coalesced, and a logic 0 in the output means that blocks A and B **should not** be coalesced:

A	B	Output (Coalesce?)
0	0	0
0	1	0
1	0	0
1	1	1

It is clear that the above truth table represents a logical **AND** operation, **not** a logic OR operation as recited in Applicants' claims 25, 35 and 43. Therefore, Applicants maintain that, if Forin discloses using any logic operation to form a "summary map", it is a logical **AND** operation, not a logical **OR** operation as recited in Applicants' claims.

Again, the whole point of the above lengthy analysis is that the Examiner has mischaracterized Forin's relied upon disclosure, i.e., Forin does *not* disclose or suggest "as a logical OR" (or union) as the Examiner asserts.

Therefore, no *combination* of the cited references produces *all of the limitations* of Applicants' claims 25, 35, 43 or 51. For at least this reason, the rejection is improper and should be withdrawn.

**b) Assuming *arguendo* Forin discloses a logical OR operation, the cited art still fails to disclose or suggest *generating a summary map as* a logical OR of said maps.**

In response to this argument, the Examiner states (Final Office Action, p. 16, under *second* instance of subheading “B” (which should be “C.”)):

Applicant points out deficiencies of the Armangau and Forin reference [*sic*] singly. However, as is pointed out above in the 35 USC § 103 rejection argument, the Examiner has relied upon the **combined** teaching of Armangau and Forin.

The Examiner is mistaken: Applicants’ argument was clearly directed to the cited *combination* of references. Applicants’ argument was merely responsive to the Examiner’s characterization of the references. To support a rejection for obviousness, the cited combination must teach or suggest **all of the claim limitations**. *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) *aff’d mem.* 738 F.2d 453 (Fed. Cir. 1984); MPEP 2143.03. A necessary prerequisite for determining whether the cited combination teaches all of the claim limitations is ascertaining each reference’s **individual** teachings. The Examiner has discussed the references individually in characterizing their separate teachings, as a preliminary step in citing their combination. Consequently, it is reasonable and appropriate for Applicants to respond to that discussion by **rebutting** the Examiner’s separate characterization of any one or more of the references’ individual teachings. To refrain from doing so would be to allow the Examiner to conveniently gloss over the deficiencies in their teachings as used in the alleged combination (which is exactly what the Examiner has done).

Turning, therefore, to the substance of Applicants’ argument: It is incorrect for the Examiner to argue that the separate limitations of a claim taken by themselves are known or obvious and that “therefore” the whole subject-matter claimed is obvious. Under section 103, the claimed invention *as a whole* must be obvious to support a

rejection.

Assuming *arguendo* Forin discloses a logical OR in connection with the coalescing of memory blocks, **that operation in Forin has *nothing to do with* generating any summary map based on maps indicating free and in-use blocks.** Consequently, there cannot be said to be any teaching or suggestion in the cited references to *generate a summary map as* a logical OR of such maps.

Further, there is simply ***no motivation or suggestion*** for one of ordinary skill in the art to make such a combination, nor is there any ***reasonable expectation of success***. The motivation alleged by the Examiner to combine Forin with Armangau does not withstand scrutiny. According to the Examiner, the motivation would be, “in order to represent an allocation state of the corresponding memory block in view of Forin, as doing so would give the added benefit of managing the memory blocks and tracks changes in allocation state via hierarchical bit map as taught by Forin” (Final Office Action, p. 4). The Examiner’s statement essentially boils down to: ‘The motivation to combine the teachings of Forin with those of Armangau would be to apply the principles of Forin to the system of Armangau.’ That “logic” is circular and therefore flawed. That is exactly the type of conclusory, unsupported statement of motivation which the courts have held to be inadequate to sustain an obviousness rejection. The Examiner must explain **why** combining the teachings of the references in this way would be desirable. “[T]he showing [of motivation to combine the references] **must be clear and particular**” findings of fact based on **actual evidence**, not merely broad conclusive statements. *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999)(emphasis added).

Furthermore, it is not even clear that a “hierarchical bit map as taught by Forin” could even be successfully implemented in the system of Armangau (assuming *arguendo* there was some motivation). As such, there is **no reasonable expectation of success**.

Thus, even assuming *arguendo* Forin discloses a logical OR operation, the cited art still fails to disclose or suggest **generating a summary map as** a logical union of maps indicating free and in-use blocks. Hence, no *combination* of Armangau and/or Forin discloses or suggests generating a summary map as a logical OR of maps indicating free and in-use blocks. For at least this additional reason, therefore, the rejections are improper and should be withdrawn.

**2. Armangau does not disclose or suggest a map of information indicating in-use blocks and free blocks associated with a file system.**

The Examiner cites Armangau as teaching the limitation of maintaining a map of information indicating in-use blocks and free blocks associated with a file system. Applicants respectfully submit that Armangau fails to teach or suggest such a limitation. On pages 16-17 of the present Final Office Action the Examiner responds to Applicants’ argument by citing Armangau at col. 3, lines 23-55. In particular, the Examiner emphasizes Armangau’s disclosure relating to a *bitmap*. However, the bitmap discussed at col. 3, lines 23-55 in Armangau only indicates whether storage locations have been **modified** or not. That is not the same as indicating whether storage locations are free or in-use. The fact that a storage location has been modified or not does not necessarily indicate whether that storage location is free or in use.

Armangau does not disclose or suggest maintaining a map of information indicating in-use blocks and free blocks associated with a file system, per claims 25, 33 and 43, much less an **active** file system per independent claims 25 and 32.

The Examiner also contends that Armangau teaches a map of information indicating free blocks “as a list of pointers to free tracks, col. 13, line 66 to col. 14, line 7” (Final Office Action, p. 3). The “list of pointers to free tracks” to which the Examiner refers are elements 109 and 110 in Fig. 5 of Armangau. However, lists 109 and 110 do **not** contain information indicating **in-use** blocks or tracks, and they are associated with **snapshots, not an active file system** per claims 25 and 32.

On the other hand, at least some of elements 105, 106, 107, and 108 may relate to an active file system; however, those elements do **not** contain any information about **free blocks** or tracks, and therefore, they do not contain sufficient information to constitute a map of in-use and free blocks of an active file system per Applicants’ claims.

Furthermore, the **separate** sets of information represented by elements 105 – 110 in Armangau cannot reasonably be viewed collectively as a “map” of in-use and free blocks of a file system. Nowhere does Armangau disclose any **map** of information indicating both **in-use blocks and free blocks** associated with a particular file system, per claims 25, 32, 43 and 51, much less an **active** file system as recited in claims 25 and 32.

Thus, no combination of Armangau and/or Forin discloses or suggests maintaining a map of information indicating in-use blocks and free blocks associated with a file system, per claims 25, 32, 35, 43 and 51. For this additional reason,

therefore, the rejections are improper and should be withdrawn.

**3. The cited combination does not teach or suggest generating a summary map as a logical OR of maps indicating free and in-use blocks for at least two persistent point-in-time images.**

The Examiner cites Armangau for this teaching. In response to Applicants' argument, the Examiner states (Final Office Action, p. 18, under subheading "E"):

Applicant points out deficiencies of the Armangau and Forin reference [*sic*] singly. However, as is pointed out above in the 35 USC § 103 rejection argument, the Examiner has relied upon the **combined** teaching of Armangau and Forin.

The Examiner is mistaken. Applicants' argument was clearly directed to the cited *combination* of references (see paragraph at middle of page 19 of Applicant's last response). Applicants' arguments are merely responsive to the Examiner's characterization of the references. To support a rejection for obviousness, the cited combination must teach or suggest **all of the claim limitations**. *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) *aff'd mem.* 738 F.2d 453 (Fed. Cir. 1984); MPEP 2143.03. A necessary prerequisite for determining whether the cited combination teaches all of the claim limitations is ascertaining each reference's **individual** teachings. The Examiner has discussed the references individually in characterizing their separate teachings, as a preliminary step in citing the combination. Consequently, it is reasonable and appropriate for Applicants to respond to that discussion by **rebutting** the Examiner's characterization of any one or more of the references' individual teachings. To refrain from doing so would be to allow the Examiner to conveniently gloss over the deficiencies in their teachings regarding the alleged

combination (which is exactly what the Examiner has done).

Turning now to the substance of Applicants' argument, the Examiner cites Armangau for the teaching of generating a summary map as a logical OR of maps indicating free and in-use blocks *for at least two persistent point-in-time images*. Applicants respectfully submit that, if the Examiner maintains this rejection or asserts a similar new rejection, the Examiner is obligated to clarify **exactly what feature in Armangau** (or another reference) the Examiner considers to be a summary map of maps indicating free and in-use blocks, of at least two persistent point-in-time images of a file system, as recited in Applicants' claims. "It is important for an examiner to properly communicate the basis for a rejection so that the issues can be identified early and the applicant can be given a fair opportunity to reply." MPEP § 706.02(j).

The Examiner has cited Fig. 6 of Armangau. However, Fig. 6 does **not** indicate any **free** blocks, and certainly does **not** indicate **free** blocks of an **active** file system as per claims 25 and 32. Consequently, Applicants maintain that Armangau does not teach or suggest generating a summary map as a logical OR **of maps** indicating free and in-use blocks of at least two persistent point-in-time images of a file system.

In view of the above points, the cited *combination* of references does not disclose or suggest *all of the limitations* of Applicants' independent claims. For this additional reason, therefore, the rejections are improper and should be withdrawn.

### **Claim 32**

Additionally, regarding claim 32:

**The cited art fails to disclose or suggest "deleting said particular snapshot,**

***wherein said deleting involves, for a block used by said particular snapshot, indicating said block is free in said summary map depending on a snapshot just prior to said particular snapshot and a snapshot just after said particular snapshot.”***

The Examiner admits that Armangau fails to teach this limitation of claim 32. However, the Examiner contends that Goldstein discloses it at col. 4, lines 41-51, and Fig. 4 (Final Office Action, pp. 10, 19-20). The Examiner emphasizes sentences which refer to the deletion or partial deletion of a given snapshot, within a succession of snapshots.

The Examiner is clearly wrong. The cited disclosure in Goldstein has little or no relevance to this limitation of claim 32, beyond the fact that it discusses deletion of a snapshot within a succession of snapshots. The cited disclosure **clearly** does not teach or even remotely suggest that deletion of a particular snapshot can involve, *for a block used by said particular snapshot, indicating said block is free in a summary map depending on a snapshot just prior to said particular snapshot and a snapshot just after said particular snapshot.*

Consequently, no *combination* of the cited references can produce the invention recited in claim 32. For this additional reason, therefore, claim 32 and all claims which depend on it are patentable over the cited art.

In response to Applicants' argument, the Examiner also states (Final Office Action, pp. 20-21, under subheading "F"):

Applicant points out deficiencies of the Armangau and reference [*sic*] singly. However, as is pointed out above in the 35 USC § 103 rejection argument, the Examiner has relied upon the **combined** teaching of Armangau and Forin.



The Examiner is mistaken. Applicants' argument was directed to the cited *combination*. Applicants' arguments are merely responsive to the Examiner's characterization of the references. To support a rejection for obviousness, the cited combination must teach or suggest **all of the claim limitations**. *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) *aff'd mem.* 738 F.2d 453 (Fed. Cir. 1984); MPEP 2143.03. A prerequisite for determining whether the cited combination teaches all of the claim limitations is ascertaining each reference's **individual** teachings. The Examiner has discussed the references individually in characterizing their separate teachings, as a preliminary step in citing the combination. Consequently, it is reasonable and appropriate for Applicants to respond to that discussion by **rebutting** the Examiner's characterization of any one or more of the references' individual teachings. To refrain from doing so would be to allow the Examiner to conveniently gloss over the deficiencies in their teachings regarding the alleged combination (which is exactly what the Examiner has done).

#### **4. Conclusion**

For each of the above independent reasons, the rejections are improper and should be withdrawn.

#### **Dependent Claims**

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

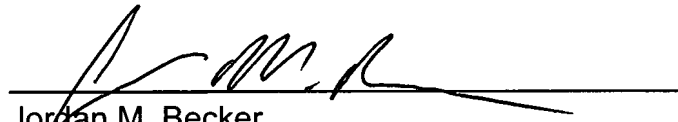
Conclusion

For the foregoing reasons, the present application is believed to be in condition for allowance, and such action is earnestly requested.

If there are any additional charges/credits, please charge/credit our deposit account no. 02-2666.

Respectfully submitted,  
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: April 5, 2007

  
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